SOCIETIES AND ACADEMIES

LONDON

Geological Society, June 23.*—Mr. John Evans, V.P.R.S., president, in the chair.—On the Granitoid and associated Metamorphic Rocks of the Lake-district, by J. Clifton Ward.

Part I. *On the Liquid Cavities in the Quartz-bearing Rocks of the Lake-district.*—The object of this paper was to examine into the evidence afforded by the liquid cavities of the granitoid rocks of the Lake-district, with reference to the pressure under which these rocks may have consolidated. In the first division of the subject the geological relations of the three granitic centres of the district were considered, and it was shown that these several granitic masses probably solidified at depths varying from 14,000 feet to 30,000 feet. The most probable *maximum* depth for the Skiddaw granite was stated as 30,000 feet; the *maximum* for the Eskdale granite 22,000 feet; and for the Shap granite 14,000 feet. These maximum depths were arrived at by estimating the greatest thickness of strata that were ever, at one time, accumulated above the horizon of the top of the Skiddaw slates. The mode of microscopic examination, together with a description of the precautions taken in measuring the relative sizes of the cavities and their contained vacuities, formed the second division of the paper. It was stated that all the measurements used in the calculations were made from cases in which the vacuity mixed freely in the liquid of the cavity, and an approximately *perfect* case for measurement was defined to be one in which the outline of the liquid cavity was sharply defined all round in one focus, and in which the vacuity moved freely to every part of the cavity *without going out of focus*. Then followed the general results of the examination. Restricting the measurements to such cases as those above mentioned, the results were found to be generally consistent with one another, and with those previously obtained by Mr. Sorby in his examination of other granitic districts. From the fact that the calculated pressure in feet of rock was in all cases greatly in excess of the pressure which could have resulted from the thickness of overlying rocks, it was inferred as probable that these granitic masses were not *directly* connected with volcanic action, by which the pressure might have been relieved, but that the surplus pressure was spent in the work of elevation and contortion of the overlying rocks. Microscopic, combined with field evidence, was thought to indicate that the Shap granite, though mainly formed at a depth similar to that at which the Eskdale granite consolidated, was yet itself finally *consolidated* at a much less depth, the mass having eaten its way upwards at a certain point, and perhaps representing an unsuccessful effort towards the formation of a volcanic centre. The examination showed that the *mean* of the pressures under which the Lake-district granites probably consolidated was nearly the same as the *mean* which Mr. Sorby arrived at for those of Cornwall. In conclusion the author stated that he wished these results to be considered as preliminary only, since the *complete* investigation would necessarily occupy far more time than was at his disposal; at the same time he ventured to hope that *general* accuracy was insured, while pointing to the many little-known causes which might affect the conclusions.

Part II. *On the Eskdale and Shap Granites, with their associated Metamorphic Rocks.*—The author brought forward evidence in this paper to prove the possibility of the formation of granite by the extreme metamorphism of volcanic rocks. The passage is shown in the field, and may be observed in a complete series of hand specimens. Frequently, indeed, the actual junction is well marked, but in other cases the transition is gradual; and there occur at some little distance from the main mass, inlying patches of what may be called bastard granite. The microscopic examination proves the passage from a distinctly fragmentary (ash) to a distinctly crystalline rock, and to granite itself. Also the chemical composition of the altered rocks agrees very closely with that of the granite. Both Eskdale and Shap granite were believed to have been formed *mainly* from the rocks of the volcanic series by metamorphism at considerable depths; but the granite of Shap was thought to be in great measure intrusive amongst those particular beds which are now seen around it. A decided increase in the proportion of phosphoric acid was noted in the volcanic rocks on approaching the granite, and a decrease in carbonic acid.

On the Correlation of the Deposits in Cefn and Pontnewydd Caves, with the Drifts of the neighbourhood, by Mr. D. Mackintosh. Believing that the time has arrived for making some attempt to correlate cavern-deposits with glacial and interglacial drifts, the author ventures to bring forward the results of a personal examination of the remnants of the deposits in Cefn and Pontnewydd caves, compared with old accounts given by Mr. Joshua Trimmer and others. He has been led to regard the following as the sequence of deposits before the caves were nearly cleared out (order ascending):—1. Loam with bones and smoothly rounded pebbles, nearly all local (cemented into conglomerate in Pontnewydd cave). As a few foreign pebbles of felstone have been found in this bed, it could not have been deposited by the adjacent river Elwy before the great glacial submergence; and the author gives reasons for believing that it was not introduced by a freshwater stream from the boulder-clay above in Post-glacial times, but that it may possibly represent the middle drift of the plains, and may have been washed in by the sea during the rise of the land. After emergence, and during a comparatively mild interglacial period, bones of animals may have been introduced by rain through fissures in the roof of the cave, and these may have become partly mixed up with the underlying pebbly deposit. 2. Stalagmite, from less than an inch to two feet in thickness, accumulated during a continuance of favourable conditions (apparently absent in Pontnewydd cave). Bones of animals were again brought in by rain or by hyænas, and were afterwards worked up into the following deposit:—3. Clay, with bones, angular and subangular fragments of limestone, pebbles of Denbighshire sandstone, felstone, &c. (palæolithic flint implements and a human tooth in Pontnewydd cave according to Prof. T. M'Kenny Hughes). This clay once filled the Cefn cave nearly to the roof. There are reasons for believing that it was principally introduced through the mouth of the cave, that it is of the same age with the neighbouring upper boulder-clay, and that it is not a freshwater redeposit of that clay. It was probably washed in during a second limited submergence. 4. Loam and coarse sand charged with minute fragments of sea-shells. Portions of this deposit may still be found in the Cefn cave; and it may have been introduced through fissures in the roof by the sea as the land was finally emerging.

Geological Notes from the State of New York, by Mr. T. G. B. Lloyd, C.E. The substance of this paper comprises notes, accompanied by drawings and sketches of various matters of geological interest which fell under the author's observation whilst residing some years ago in the State of New York. The different subjects are divided under the following heads:—(1) Groovings and channelings in limestone running across the bed of Black River at Watertown, Jefferson co. (2) Descriptions of the superficial beds of boulder-clay, sand, and gravel which were exposed to view in the district around the village of Theresa during the construction of the Black River and Morristown railroad. (3) A description, with a general and detailed drawing to scale, of a remarkable "Giant's Kettle" near Oxbow, in Jefferson co. (4) An account of some peculiar flower-pot-shaped blocks of sandstone discovered in a quarry of Potsdam sandstone at the village of Theresa. The author in conclusion refers to a statement in a paper on Niagara by Mr. Belt, F.G.S., published in the *Quart. Journ. of Science* for April 1875, in which it is stated that the sections described as occurring near the Falls are typical of the superficial beds that mantle the whole of the northern part of the State of New York and Ohio and much of Canada. He is unable to find any description of a deposit which bears a near resemblance to the boulder-clay occurring in the district around the village of Theresa, in the descriptions of various authors of the superficial deposits of the northern part of the State of New York and Canada. He therefore ventures to remark that no section can be considered as typical of the whole of the north part of the State of New York which does not recognise the existence of the deposit in question.

On a Vertebrate Fossil from the Gault of Folkestone, which also occurs in the Cambridge Greensand, by Prof. H. G. Seeley, F.L.S. The author describes a bone having the general form of an incisor tooth obtained from the Gault of Folkestone by Mr. J. S. Gardner, F.G.S. The flattened cylindrical end of a specimen from the Cambridge Greensand has been figured as a caudal vertebra of *Pterodactylus simus*. A microscopic section of the expanded end of a specimen from the Cambridge Greensand exhibits ordinary osseous tissue, showing that the fossil is probably a dermal spine from the tail of a Dinosaur. The Gault specimen is smaller than the examples from Cambridge.

Royal Horticultural Society, July 7.—Scientific Committee.—J. D. Hooker, F.R.S., in the chair.—A paper on the resting-spores of the potato disease was read by Worthington

* Continued from p. 243.

Smith, F.L.S. These were identified with the bodies which Mr. Berkeley had lately regarded as a species of *Protomyces*, and the cause of a new malady in the potato. The following are the principal points in this very important communication :—On receiving authentic specimens of diseased plants from Mr. Barron, Gardener-in-Chief to the Society, the brown spots on the potato-leaves at once called to mind the figures of some species of *Protomyces*, and the dimensions agreed tolerably well with some described plants of that genus, but the spots, when seen under a high power, appeared very unlike any fungus, and they were very sparingly mixed with other bodies much smaller in diameter, and with a greater external resemblance to true fungus spores. These latter spore-like bodies were of two sizes—one transparent and of exactly the same size as the cells of the leaf (and therefore very easily overlooked), and the other dark, reticulated, and much smaller. A few mycelial threads might be seen winding amongst the cellular tissue. The author's opinion, therefore, was soon formed that the "new" potato disease was no other than the old *Peronospora infestans* in an unusual and excited condition. That climatic conditions had thrown the growth of this fungus forward and out of season was probable ; but the idea that the pest would not at length attack all and every sort of potato seemed unreasonable, though the more tender sorts might be the first to suffer. From day to day the diseased leaves and stems and tubers were kept between pieces of very wet calico, in plates under glass, and it was immediately noticed that the continued moisture greatly excited the growth of the mycelial threads. So rapid was now the growth of this mycelium, that after a week had elapsed some decayed parts of the lamina of the leaf were traversed in every direction by the spawn. In about ten days the mycelium produced a tolerably abundant crop, especially in the abortive tubers, of the two-sized bodies previously seen in the fresh leaves. The larger of these bodies Mr. Smith was disposed to consider the "oospore" of the potato fungus, and the smaller bodies as the "antheridia" of the same fungus, which are often terminal in position. The filaments of the latter are commonly much articulated, and sometimes more or less moniliform or necklace-like. Both oospore and antheridium are very similar in nature and size to those described as belonging to *Peronospora alsinearum* and *P. umbelliferarum*, and this is another reason (beyond the occurrence of undoubted *P. infestans* on potato-leaves at the beginning of June) why he was disposed to look upon these bodies as the oospore and antheridium of the potato fungus. The larger bodies are at first transparent, thin, pale brown, furnished with a thick dark outer wall, and filled with granules ; at length a number (usually three) of vacuities or nuclei appear. The smaller bodies are darker in colour, and the external coat is marked with a few reticulations, possibly owing to the collapsing of the outer wall. At present he had been unable to detect any fecundating tube (described as belonging to the antheridium of other species of *Peronospora*), but he had observed the two bodies in contact in several instances. After fertilisation has taken place, the outer coat of the oospore enlarges, and appears to be cast off. Both antheridium and resting-spore are so slightly articulated to the threads on which they are borne that they are detached by the slightest touch, but with a little care it is not really difficult to see both bodies *in situ* ; and my observations lead me to think that conjugation frequently takes place after both organs are quite free. The antheridia and oospores are best seen in the wettest and most thoroughly decomposing tuber, but they occur also in both the stem and leaf. The author was also disposed to regard Montagne's *Artotrogus* as identical with the resting-spore of *Peronospora infestans*, an opinion which had long been held by Mr. Berkeley.

PARIS

Academy of Sciences, July 19.—M. Frémy in the chair.—The following papers were read :—On M. Espy's meteorological theory, by M. Faye.—On the continuation which it will be necessary to make of experimental researches on plasticodynamics, by M. de Saint-Verant. This new branch of mechanics treats of the internal motions of solid bodies in a state of plasticity. M. Tresca added some remarks on the same subject.—Experimental and clinical considerations on the nervous system with regard to its function in actions governed by the sensitive, instinctive and intellectual faculties, as well as in the so-called voluntary locomotive actions, by M. Bouillaud. The author arrives at the following conclusions :—The cerebrum and the cerebellum are both absolutely necessary for all actions which are governed by the various faculties of mind or intelligence. The cerebellum is the seat of co-ordination of the movements of walking, the cerebrum being the seat of the co-ordinating centres of the movements necessary for the execution of a great number of intellectual actions, speech in particular.—On a distinction between natural and artificial organic products. The author repeats the distinction made by him in 1860, in reply to a statement by M. Schutzenberger. This distinction is that natural bodies are always unsymmetrical.—Observations relating to M. Hirn's communication of June 23. Importance of basing the new theory of heat on the hypothesis of the vibratory state of bodies, by M. A. Ledieu.—Note on the chronology and geography of the plague in the Caucasus, in Armenia, and in Anatolie during the first half of the nineteenth century, by M. J. D. Tholozan.—On the development of the spiny rays in the scale of *Gobius Niger*, by M. L. Vaillant.—On d'Arrest's periodic comet, by M. Leveau.—Observations of Jupiter's satellites during the oppositions of 1874 and 1875. Determination of their differences of aspect and of their variation of brilliancy, by M. Flammarion. In size the decreasing order is III., IV., I., II. Intrinsic luminosity for equal surfaces I., II., III., IV. Variability in decreasing order IV., I., II., III.—Note on magnetism ; reply to an observation of M. Jamin, by M. J. M. Gaugain.—Oxy-uvitic and the cresol derived from it, by MM. A. Oppenheim and S. Pfaff. The cresol is metacresol.—On a compound of methyl oxide and hydrochloric acid, by M. C. Friedel.—On the diethylic ether of xanthoacetic acid, by MM. C. O. Cech and A. Steiner.—On the estimation of carbon disulphide in the sulphocarbonates of potassium and sodium, by MM. David and Rommier.—On the mode of action of the pillars of the diaphragm, by M. G. Carlet.—On the reproduction of eels, by M. C. Dareste.—The morphological elements of the oblong leaves of the monocotyledons, by M. D. Clos.—On a claim of priority relative to a fact of botanical geography, by M. Ch. Contejean.—During the meeting M. Mouchez was elected a member of the Astronomical section to replace the late M. Mathieu.

BOOKS AND PAMPHLETS RECEIVED

BRITISH.—Chambers' Encyclopædia. 10 vols., new and revised edition (W. and R. Chambers).—Reports of the Medical Officer of the Privy Council and Local Government Board. New Series, No. 3 (Spottiswoode).—On the Inequalities of the Earth's Surface viewed in connection with the Secular Cooling : Osmond Fisher, M.A. (Cambridge Philosophical Transactions).—Flora of Eastbourne : F. C. S. Roper, F.L.S. (Van Voorst).—Travels in Portugal : John Latouche (Ward, Lock, and Tyler).—Second Supplement to Watts's Dictionary of Chemistry (Longmans).—Transactions of the Manchester Geological Society, Vol. xiii. Part 10.—Health in the House : Catherine M. Buckton (Longmans).—Hydrology of South Africa : J. Croumbie Brown, LL.D. (H. S. King and Co.)—Rudiments of Geology : Samuel Sharp, F.S.A., F.G.S (E. Stanford).—The Skull and Brain ; their Indications of Character and Anatomical Relations : Nicholas Morgan (Longmans). North Staffordshire Naturalists' Field Club Addresses, Papers, &c.—On the Sensations of Tone as a Physiological Basis for the Theory of Music, by H. Helmholtz ; translated by A. J. Ellis, F.R.S. (Longmans).—Reports and Proceedings of the Miners' Association of Cornwall and Devon for 1874.

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ERRATA.—Page 232, col. 1, line 24 from bottom, for "currents" read "cumuli" ; line 22 from bottom, for "lovely" read "lowly."